

Amendments to the Claims

1. (Currently Amended) An electrical stimulator for the treatment of intractable pain syndromes, comprising:

an interferential current generator ~~for generating~~ that generates an interferential alternating current output ~~by-using common sine wave generators~~ generating first and second sinusoidal signals having different first and second frequencies, with a base medium frequency of at least 500Hz but no more than 20KHz; and

at least two pairs of implantable electrodes connected to said interferential current producing generator and adapted to be located at predetermined locations proximate to a subject's spinal cord wherein each pair of said at least two pairs of implantable electrodes produces a separate electrical circuit, each transmitting one of said first and second sinusoidal signals ~~a sine wave of a different frequency,~~ such that the first and second frequencies interfere with each other to produce at least one beat frequency signal proximate to the subject's spinal cord.

2. (Original) The stimulator of claim 1, wherein said interferential current generator comprises:

a pulse generator that generates digital signal pulses; and

a digital signal processor connected to said pulse generator that processes the digital signal pulses to approximate a sine-wave-like output waveform.

3. (Original) The stimulator of claim 1, wherein said interferential current generator comprises:
 - a pulse generator that generates digital signal pulses; and
 - a field-programmable gate array connected to said pulse generator that processes the digital signal pulses to approximate a sine-wave-like output waveform.
4. (Original) The stimulator of claim 1, wherein said interferential current includes a resultant beat frequency of no more than 250 Hz.
5. (Original) The stimulator of claim 1, wherein said interferential current includes a voltage output of 11 volts maximum for each circuit.
6. (Original) The stimulator of claim 1, wherein said interferential current includes a pulse width of 210 microseconds.
7. (Original) The stimulator of claim 1, wherein said interferential current includes a pulse width with a range of at least 10 microseconds but no more than 600 microseconds.
8. (Original) The stimulator of claim 1, wherein two quadripolar leads are used to produce two interferential currents.
9. (Currently Amended) An electrical stimulator for the treatment of intractable pain syndromes, comprising:

a pulse generator that generates digital signal pulses;

a digital signal processor connected to said pulse generator that generates a sine-wave-like output waveform that is further processed into first and second circuits having different first and second output frequencies; and

two pairs of implantable electrodes connected to said digital signal processor and adapted to be positioned proximate to a subject's spinal cord at predetermined locations ~~to produce an interferential current output waveform~~ such that the different output frequencies from said first and second circuits interfere to produce at least one beat frequency signal proximate to the spinal cord.

10. (Original) The stimulator of claim 9, wherein said interferential current output waveform includes a base medium frequency of at least 500Hz but no more than 20KHz.

11. (Original) The stimulator of claim 9, wherein said interferential current output waveform includes a resultant beat frequency of no more than 250 Hz.

12. (Currently Amended) An electrical stimulator for the treatment of intractable pain syndromes, comprising:

a pulse generator that generates digital signal pulses;

a field-programmable gate array connected to said pulse generator that generates a sine-wave-like output waveform that is further processed into first and second circuits having different first and second output frequencies; and

two pairs of implantable electrodes connected to said field-programmable gate array and adapted to be positioned proximate to a subject's spinal cord at predetermined locations ~~to produce an interferential current output waveform~~ such that the different output frequencies from said first and second circuits interfere to produce at least one beat frequency signal proximate to the spinal cord.

13. (Original) The stimulator of claim 12, wherein said interferential current output waveform includes a base medium frequency of at least 500Hz but no more than 20KHz.

14. (Original) The stimulator of claim 12, wherein said interferential current waveform includes a resultant beat frequency of no more than 250 Hz.

15. (Currently Amended) An electrical stimulator for the treatment of intractable pain syndromes, comprising:

an interferential current generator ~~for generating~~ that generates an interferential alternating current output including first and second sinusoidal signals having different first and second frequencies, with a base medium frequency of at least 500Hz but no more than 20KHz; and

at least two pairs of implantable electrodes connected to said interferential current producing generator and adapted to be located at predetermined locations proximate to a subject's dorsal column wherein each of said at least two pairs of implantable electrodes produces a separate electrical circuit, each carrying one of said first and second sinusoidal signals ~~an alternating current of a different frequency, such that the first and second~~

frequencies interfere with each other to produce at least one beat frequency signal proximate to the subject's dorsal column.

16. (Original) The stimulator of claim 15, wherein said interferential current generator comprises:

a pulse generator that generates digital signal pulses; and

a digital signal processor connected to said pulse generator that processes the digital signal pulses to approximate a sine-wave-like output waveform.

17. (Original) The stimulator of claim 15, wherein said interferential current generator comprises:

a pulse generator that generates digital signal pulses; and

a field-programmable gate array connected to said pulse generator that processes the digital signal pulses to approximate a sine-wave-like output waveform.

18. (Original) The stimulator of claim 15, wherein said interferential current includes a resultant beat frequency of no more than 250 Hz.

19. (Original) The stimulator of claim 15, wherein said interferential current includes a voltage output of 11 volts maximum for each circuit.

20. (Original) The stimulator of claim 15, wherein said interferential current includes a pulse width of 210 microseconds.

21. (Original) The stimulator of claim 15, wherein said interferential current includes a pulse width with a range of at least 10 microseconds but no more than 600 microseconds.

22. (Original) The stimulator of claim 15, wherein two quadripolar leads are used to produce two interferential currents.

23. (Currently Amended) An electrical stimulator for the treatment of intractable pain syndromes, comprising:

a pulse generator that generates digital signal pulses;

a digital signal processor connected to said pulse generator that generates a sine-wave-like output waveform that is further processed into first and second circuits having different first and second output frequencies; and

two pairs of implantable electrodes connected to said digital signal processor and adapted to be positioned proximate to a subject's dorsal column at predetermined locations ~~to produce an interferential current output waveform~~ such that the different output frequencies from said first and second circuits interfere to produce at least one beat frequency signal proximate to the dorsal column.

24. (Original) The stimulator of claim 23, wherein said interferential current output waveform includes a base medium frequency of at least 500Hz but no more than 20KHz.

25. (Original) The stimulator of claim 23, wherein said interferential current output waveform includes a resultant beat frequency of no more than 250 Hz.

26. (Currently Amended) An electrical stimulator for the treatment of intractable pain syndromes, comprising:

a pulse generator that generates digital signal pulses;

a field-programmable gate array connected to said pulse generator that generates a sine-wave-like output waveform that is further processed into first and second circuits having different first and second output frequencies; and

two pairs of implantable electrodes connected to said field-programmable gate array and adapted to be positioned proximate to a subject's dorsal column at predetermined locations to produce an interferential current output waveform such that the different output frequencies from said first and second circuits interfere to produce at least one beat frequency signal proximate to the dorsal column.

27. (Original) The stimulator of claim 26, wherein said interferential current output waveform includes a base medium frequency of at least 500Hz but no more than 20KHz.

28. (Original) The stimulator of claim 26, wherein said interferential current waveform includes a resultant beat frequency of no more than 250 Hz.

29. (Currently Amended) A method for the treatment of persistent chronic pain syndromes using electrical stimulation of the spinal cord, said method comprising:

connecting a pulse generator to a digital signal processor and supplying digital signal pulses to said digital signal processor which produces a sine-wave-like current waveform which is further processed and output to first and second pairs of implantable electrodes, wherein first and second circuits are created, respectively;

positioning said first pair of implantable electrodes proximate to a subject's spinal cord at one set of diagonal corners of a targeted area;

positioning said second pair of implantable electrodes proximate to the subject's spinal cord at the other set of diagonal corners of the targeted area; and

transmitting waveforms of different first and second frequencies through said first and second circuits respectively so that the first and second frequencies interfere to create at least one beat signal proximate to the targeted area, thus creating an interferential current with a base medium frequency of at least 500Hz but no more than 20KHz.

30. (Original) The method according to claim 29, wherein said method further includes varying locations of said first and second pairs of implantable electrodes along the spinal cord.

31. (Original) The method according to claim 29, wherein said method further includes modulating outputs of amplitudes of said first and second circuits.

32. (Original) The method according to claim 29, wherein said method includes creating an interferential current with a resultant beat frequency of no more than 250 Hz.

33. (Original) The method according to claim 29, wherein said method includes creating the interferential current with a voltage output of 11 volts maximum for each circuit.

34. (Original) The method according to claim 29, wherein said method includes creating the interferential current with a pulse width of 210 microseconds.

35. (Original) The method according to claim 29, wherein said method includes creating the interferential current with a pulse width comprising a range of at least 10 microseconds but no more than 600 microseconds.

36. (Original) The method according to claim 29, wherein said method includes creating two interferential currents by using two quadripolar leads.

37. (Currently Amended) A method for electrical stimulation of the spinal cord, said method comprising:

connecting a pulse generator to a digital signal processor and supplying digital signal pulses to said field-programmable gate array which produces a sine-wave-like current waveform which is further processed and output to first and second pairs of implantable electrodes, wherein first and second circuits are created, respectively;

positioning said first pair of implantable electrodes proximate to a subject's dorsal column at one set of diagonal corners of a targeted area;

positioning said second pair of surface electrodes proximate to the subject's dorsal column at the other set of diagonal corners of the targeted area; and

transmitting waveforms of different first and second frequencies through said first and second circuits respectively so that the first and second frequencies interfere to create at least one beat signal proximate to the targeted area, thus creating an interferential current with a base medium frequency of at least 500Hz but no more than 20KHz.

38. (Original) The method according to claim 37, wherein said method further includes varying positions of said first and second pairs of implantable electrodes along the dorsal column.

39. (Original) The method according to claim 37, wherein said method further includes modulating outputs of amplitudes of said first and second circuits.

40. (Original) The method according to claim 37, wherein said method includes creating an interferential current with a resultant beat frequency of no more than 250 Hz.

41. (Original) The method according to claim 37, wherein said method includes creating an interferential current with a pulse width of 210 microseconds.

42. (Original) The method according to claim 37, wherein said method includes creating two interferential currents by using two quadripolar leads.